Literature Review

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1 Star-based WSNs

Monitoring environmental conditions like air quality or wildfire risk is crucial, and Wireless Sensor Networks (WSNs) offer a promising solution. But designing efficient and reliable WSNs presents challenges, particularly in balancing low-power consumption with robust data transmission – a key concern in the realm of Internet of Things (IoT) [8].

Star-based Wireless Sensor Networks (WSNs) have emerged as a popular approach for environmental monitoring, exemplified by Lazarescu et al.'s wildfire detection system [4]. These networks resemble constellations, with individual sensor nodes dispersed like stars and transmitting data to a central gateway node, analogous to a central star. This architecture prioritizes reliable communication, particularly crucial in scenarios like wildfire detection, by utilizing dedicated radio channels within the unlicensed Industrial, Scientific, and Medical (ISM) band [7]. The central gateway node acts as a hub, collecting and buffering data from all sensors before forwarding it to a remote server via the internet.

Building upon this concept, Shah et al. crafted a similar system, but with sensors directly tethered to a computer through a dedicated transceiver pair [7]. This setup streamlines data visualization and sharing, but lacks the centralized structure of its predecessor. Interestingly, star topologies have even ventured into the realm of long-range communication, utilizing technologies like 2G/GSM to shine their light over wider areas [5].

While Star-based WSNs shine in terms of simplicity and ease of deployment, they face limitations. Scaling them up for wider coverage can be challenging [6]. Additionally, research by Shrestha et al. suggests that Mesh networks, with their interconnected nodes and redundant data paths, may offer superior reliability, especially when individual nodes fail [1].

Therefore, choosing the right WSN topology for environmental monitoring requires careful consideration. Simplicity and ease of deployment offered by Star networks might be ideal for smaller, controlled environments [2]. However, for expansive or critical monitoring applications, the enhanced reliability of Mesh networks may be the brighter star to follow [3].

References

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